BANCROFT
LIBRARY

◇

THE LIBRARY
OF
THE UNIVERSITY
OF CALIFORNIA

TILED ROOFS; THE KIND OF BUILDINGS TO WHICH THEY ARE SUITED AND A METHOD OF CONSTRUCTION THAT MAKES THEM PRACTICAL AS WELL AS PICTURESQUE: BY ARTHUR JEROME EDDY

HE art of building began with the roof. The first rude shelter was all roof and no walls; the modern "skyscraper" is all walls with a minimum of roof. With the development of higher and higher structures, the æsthetic importance of the roof becomes of less and less importance, until on the twenty-story building it is often practically flat and entirely hidden from observation below, therefore it is treated in the most practical and prosaic manner.

Where, however, the buildings are low, the roof expanse is of the very first importance; the most conspicuous feature, which, if visible from afar long before the walls are distinguishable, either adds to or detracts from the landscape and may be harmonious with its surroundings and beautiful, or utterly incongruous and ugly, quite irrespective of the manner in which the walls are treated. On approaching, the walls loom up as the roof disappears from the line of vision. Theoretically, a perfect building ought to appear at its best from a point where the eye can take in both roof and walls in something like equal proportions; if to enjoy the roof in its construction, lines and color, it is necessary to remain so far away that the walls are indistinguishable, the building, as an entirety, is æsthetically imperfect.

In happy combination of roof and wall, of sky and earth line, the genius of man has never wrought anything more perfect than the Gothic cathedral; notwithstanding its great height, the roof is visible both far and near; to the distant wayfarer it is the most impressive feature of the landscape, to the close observer it is a source of endless delight. For in its day and generation and to meet the needs and aspirations of its builders, nothing finer or more perfect could be devised or imagined,—but its reproduction at the present time is an anachronism and a confession of weakness. A temple or a cathedral which is beautiful in its surroundings and for its own purpose, may be very incongruous and ugly in ours.

To secure this fine proportion between roof and wall, it is obvious that with every increase in the height of the building there must be an even greater increase in the pitch of the roof. To make the

METHOD OF LAYING A ROOF WITH SMALL MISSION TILES.

AN ADOBE BUILDING REQUIRES A MASSIVE ROOF.

A WELL-LAID ROOF OF MODERN TILES: WATERTIGHT AND IMPERVIOUS TO HEAT AND COLD.

THE HEAVY OLD MISSION TILES WERE DESIGNED FOR BUILDINGS THAT WERE STRUCTURALLY MASSIVE.

AN OLD MISSION TILED ROOF LE
TO THE DESTRUCTION OF TIM

THE OLD TILES ARE ILL AT EA
NEAR A SMOOTH MODERN ROO

SHOWING THE IRREGULARITY
THE OLD HAND-MADE TILES.

roof of the modern steel office building visible from the narrow surrounding streets is practically an impossibility, the æsthetic problem presented is fundamentally different from anything heretofore attempted and therefore all the more worthy of solution, for there are great possibilities of perfection and beauty inherent in steel construction. These possibilities do not, however, lie along the lines of superficial imitation, but in a frank recognition of and submission to twentieth century needs and conditions. However, these considerations are aside from the present discussion, which has to do with the roofs of low buildings, with roofs which are and must be visible, and which should be the most beautiful wherever they are the most conspicuous features of the structures.

The lower the building, the more important the covering,—a proposition so true and trite that it is habitually ignored in practice. Architects exhaust their ingenuity—and their libraries—in designing buildings more or less attractive in every detail except the roof, *that* is treated as immaterial; it is left to the client to say whether he will cover with shingles, slate, tile, or tin, the decision nine times out of ten turning on the sole consideration of economy. No one is expected to look at the roof, if people do, it is an impertinence; yet the roof is to a low building what a very large hat is to a very short woman,—it makes all the difference in the world whether or no it is becoming.

EVERY variety of architecture has its appropriate roof; in fact, architectural varieties may, very likely should, be differentiated by their roofs;—arch and lintel, those two fundamental variations in structure, are but roof or covering variations. The first problem in building is how to cover space—shelter; the second is how to enclose space—protection; the latter tends to assume more massive and permanent proportions wherever the assaults of man are more destructive than the ravages of the weather.

In Oriental countries and in all portions of Europe where native architecture prevails, the roofs, whether of thatch, shingles or tile, first attract the attention of the traveler. One has but to pause a little way off, to realize how much of the charm of the distant hamlet, with church or temple in its midst, is due to the roofs, and how little, comparatively speaking, is due to the walls which are scarce visible.

The modern city may be judged, and judged very correctly, by its conglomeration of heterogeneous roofs. In the selection of a

roof for his house a man should display some of the taste he exhibits in the choice of a hat; he would not make the mistake of wearing a "tile" with a white duck suit, or a straw hat with a fur coat, so no one with any sense of the eternal fitness of things would mount a heavy Mission tile on walls of shingles or clap-boards; per contra, while it is only too commonly done for sake of economy, no one who is striving to do a good thing would think of covering with light, machine-cut shingles a low house of massive proportions, the walls of which are of adobe, concrete or plaster.

Shingles on top of brick are so common that they pass unnoticed, but they make a rather airy covering for heavy walls; gray slate is much more appropriate, and tile goes well with certain shades of brick, providing the walls give the impression of solidity and strength.

In Southern California all sorts and kinds of architecture are to be seen. This is due partly to the climate, which not merely permits, but invites, experiments in every direction, and poor building is not punished by severe cold and snow. It is also due to the in-rush of people from every quarter of the globe who have their own notions regarding the houses they want.

Each style of building brings along its own roof, with a stranger or two for the sake of company. No sooner located—never really acclimated—these various styles of architecture, instead of keeping each its own appropriate covering, begin to exchange roofs, with results which are startling.

OF THE roofings in use those most commonly seen are: Fibre—Water-proofed paper, and tarred or asphalted felt of many makes and varying thicknesses. These materials, when well made and well laid, make cheap, serviceable roofs for sheds, warehouses, factories, etc., buildings which conform frankly to their uses and wherein no attempt is made to secure æsthetic results. Curious effects are secured by shaping the heavy asphalted felt in large rolls over wood along the ridges, ends and eaves, and on first impression when the paper is new and gray in tone, the eye is made to believe the covering is of lead or other metal, but these more or less fantastic experiments serve in the long run to direct the attention to the fact that the roofing is, after all, only paper. As the sun brings the tar or asphalt to the surface, the true character is evident.

Metal—Tin and galvanized iron pressed into various and more or less fantastic shapes. These roofs are also serviceable for the same class of buildings, and they possess the advantage of resisting

fire. But when the metal is pressed into the shape of tile and painted a dull, dirty red, the roof is ugly; it is neither good tile nor honest metal, but a hybrid of no parentage. A tile roof speaks for itself, but for the metal imitation of tile no good word can be said.

Wood—Shingles, the ordinary machine-made, excellent in their place on houses of which the construction is such as to permit of nothing heavier. As dwellings of this class are in the great majority, shingles are in common use. "Shakes," the long, split, red-wood "shakes" which warp and curl more or less to the weather are exceedingly effective; incomparably more effective than shingles whereever the balance of the construction is in keeping. They are thirty-six inches long by six inches wide, about a quarter of an inch thick, and are commonly laid sixteen inches to the weather. "Shakes" may even be used in place of tiles where shingles would look too light and cheap. The great length of the "shake" together with its warp and curl to the weather, produce delightful lines and shadows. The sawed "shake" is inferior in every way.

Mineral—Slates are used, but not to any great extent on dwellings. A gray-blue slate is not cheerful, but in a gray northern climate it goes well with the common red brick; it has no place on the adobe or plaster walls of California buildings which demand color. The red slate is low in color value, flat and stiff in effect; in short, it is neutral where tile is positive. There is little that is attractive in a broad expanse of slate roof under California sunshine, while if laid in patterns of red and gray it is positively ugly.

TILE, when properly formed, baked and laid on any structure rightly designed to carry it, is the most beautiful roof covering yet devised, but when not properly formed, baked and laid, or laid on buildings for which it is not rightly intended, tile may be not only the ugliest, but the least serviceable of coverings.

Four hundred and thirty years ago it was provided by law in England that for the making of tiles "clay should be dug before November, and be stirred and turned before March," and to-day the very old tile is considered much better than the new. The same care is not taken in turning out the commercial tile in use at the present time. A good, hard-burnt tile lasts indefinitely; a thing of beauty, it comes very near being a joy forever; it is delightful in color, charming in form, and useful in service. A poor tile has little to recommend it. The hard-burned tile is, comparatively speaking, impervious to moisture, while those half baked, out of poor clay, not

only absorb moisture, but in a damp climate grow a luxuriant crop of vegetation, which may be very picturesque on out-buildings where dryness is not a prime essential, but not altogether desirable on a dwelling.

The Mission fathers no doubt followed the ancient custom of kneading or working the clay in pits under the hoofs of animals, then giving it time to ferment properly. The tiles were probably made by spreading the right quantity of clay on a board or flat surface, patting it to a cake of the right thickness and size, then deftly flopping it over a half-round piece of wood which was first well sanded so the clay would not adhere. The clay was pressed and shaped to the form by hand, trimmed about the edges, dried in the sun, and fired more or less perfectly in small kilns. The pressure of the hand gave the tile a consistency and a surface which machine-made tiles lacked. The latter are more or less porous.

The quality of the tile differed with the clay of different localities, and with the care and skill of the makers. Some are soft and very irregular, others are comparatively hard and true. Throughout the Southwest a great variety of clay is found, from the sticky *adobe*, which is little more than a tenacious mud in places, to fine potter's clay. The Mission builders took their clay as they found it and made the best of it. Transportation was too difficult in those days for them to seek and develop the finer deposits.

The thickness, size and irregularities of these old tiles and the marks of the hand which shaped them are fairly well indicated in the different illustrations. The dimensions of those shown are: length, twenty-three inches; width of broad end, twelve inches; width of narrow end, eight inches; depth, four and one-half at end, diminishing to three and one-half at narrow; thickness varied from three-eighths to three-fourths of an inch. There are no holes for nails or other fastenings. Neither are the corners clipped to economize in laying. It is a delight to caress these old tiles just as it is a delight to pass one's hand over a piece of fine pottery, for, after all, the fingers appreciate good modeling better than the eyes. No one cares to handle machine-made tiles; they are lacking in interest because devoid of character; they have never associated with human beings on terms of intimate and friendly companionship.

The manner of laying these old tiles is well shown in several of the illustrations. The bed of mud or *adobe* over the thick matting of brush on the irregular round rafters made a soft and yielding foundation for the tile. The unequal sag relieved the roof of all flat and hard lines. No attempt was made to secure perfect regu-

larity in the "lining up" of the tiles,—that was impossible, they were far too irregular in shape and thickness to permit of mechanical perfection in the alignment. The modern commercial tiles are laid to a chalk line with great precision, the result is an effect which is, comparatively speaking, monotonous in the extreme.

ONE of the illustrations shows the roof of a large bungalow laid with small Mission tiles, and incidentally the roof-line of houses beyond with the mountains in the distance. The small Mission tiles are only sixteen inches long, with a spread of eight inches at the wide end, as compared with thirty-four by twelve. They are machine-made and devoid of the human interest which attaches to the old, but otherwise they are fairly good in shape and color, and make a beautiful roof. It is not every building that will carry the old tile, but they would be exceedingly handsome on the large roof of this particular bungalow. The commercial reproductions of the large Mission tiles are not very successful. They are ugly in their proportions, thin, and, for the most part, more or less porous and defective.

This particular roof was laid twice. The tiles first used were poorly made, poorly baked and poorly laid; they absorbed water like a sponge, and dripped like an *olla*, with the result that, after four or five hours of heavy rain, countless small leaks would develop. As the tiles rested in flimsy building paper, and this on ordinary sheathing laid lengthwise of the roof instead of from ridge to eaves, there was nothing in the foundation to turn the water which the tiles failed to keep out; each tile was nailed so the paper was filled with holes to begin with.

The roof as relaid was first made tight underneath. A specially cut sheathing, the joints of which would turn water, was used; on this was laid an asphalted felt of almost the thickness and toughness of sole leather; the strips ran lengthwise, and the over-lap of four inches, though quite sufficient without cement, was thoroughly cemented; on this heavy felt the tiles were laid without nailing, as the pitch of the roof was so low that nails were not necessary; as a final precaution, the over-laps of all the lower tiles were joined with an oil cement, fifty pounds to the square being used. As the tiles were specially burned and selected, it is believed that the roof is trebly tight, that the tile, the asphalted felt, the sheathing—each independently of the other—will turn water, while the three are quite impervious to heat and cold.

TILED ROOFS FOR MODERN BUILDINGS

AT PRESENT there is a slight revival of interest in the use of the old tiles, they are being carefully preserved, but, unhappily, the new buildings on which they are used seldom conform in design and construction to the massive irregularities of the tiles and the results are not satisfactory. For instance, they are exceedingly ill-at-ease in their painful regularity on a lightly built building, and the very modern red brick chimney worries them.

Tile is the normal covering for the adobe, cement or plaster house, providing, of course, the construction of the walls is sufficiently massive to carry the heavy roof,—to carry it to the eye as well as in fact. A heavy tile roof on light walls, or on walls the proportions of which are only too apparently false and artificial, produces a sense of discomfort, the roof sinks in the estimation in more senses than one.

Very little pains have been taken to save the roofs of the California Missions, though not a little has been done to preserve some of the walls and interiors. In many instances the roofs have been sheathed and shingled, a very matter-of-fact and inappropriate covering for walls so substantial. In some places the tiles and shingles appear side by side; in others the old tiles have been relaid loosely over shingles.

While the old Mission tiles make picturesque and serviceable roofs in Southern California, they would not serve so well in the colder climates of the north and east, as they are a poor protection against snow. From time immemorial the ingenuity of builders has been exercised in the endeavor to lay a weather-proof tile roof in a cold climate. In England an ancient custom prevailed to bed the tiles in hay or moss, "when the roof is of full pitch this suffices without mortar, they may even be laid dry. But with any less pitch, some precaution must be used to keep out drifting snow, and such wet as may be blown up between the tiles lifted by the force of the wind. In lieu of oak pegs, extra large flat-headed wrought nails, made of pure zinc or of zinc and copper have been used."

The Japanese method of laying a tiled roof is described by Prof. Edward F. Morse as follows "The boarded roof is first roughly and thinly shingled, and upon this surface is then spread a thick layer of mud into which the tiles are firmly bedded. The mud is scooped up from some ditch or moat, and is also got from the canals. In the city one often sees the men getting the mud for this purpose from the deep gutters which border many of the streets. This is kneaded and worked with hoe and spade till it acquires the con-

sistency of thick dough. In conveying this mess to the roof no hod is used. The material is worked into large lumps by the laborer, and these are tossed one after another to a man who stands on a staging or ladder, who in turn pitches it to the man on the roof, or, if the roof be high, to another man on a still higher staging. The mud, having been got to the roof, is then spread over it in a thick and even layer. Into this the tiles are then bedded, row after row. There seems to be no special adhesion of the tiles to this substratum of mud, and high gales often cause great havoc to a roof of this nature. In the case of a conflagration, when it becomes necessary to tear down buildings in its path, the firemen appear to have no difficulty in shovelling the tiles off a roof with ease and rapidity.

"The older a tile is the better it is considered for roofing purposes . . . Second-hand tiles, therefore, are always in greater demand. A new tile, being very porous and absorbent, is not considered so good as one in which time has allowed the dust and dirt to fill the minute interstices, thus rendering it a better material for shedding water."

IN THE effort to produce tiles which will "lay tight" and in themselves be rain and snow proof, all sorts of queer and ugly patterns are turned out. Most of these "patented" tiles are half baked and soft; were they baked properly their joints and laps would not meet, as their inventors intend. They depend for their color upon "slipping" or glazing. Tiles which are bold and eautiful in form, well vitrified and fine in color cannot be laid tight. Dust, rain and snow proof joints are impossible. The finer and handsomer the tile, the greater the necessity of making a perfect foundation.

The almost endless varieties of flat, "pan," inter-locking, and "patented" tiles may give the effect of color at a distance, but color is not the only effect to be sought in a roof, shape is equally important. The roof is the hat of the house, and the shape of a man's hat is quite as important as its color.

Whether tile can be used, and the pattern, depends a good deal upon the pitch, and the pitch to be given a roof depends upon three considerations, climate, materials used, and effect desired. Generally speaking, the warmer the climate, the flatter the roof. In a southern climate, a steep roof is simply a device for catching and holding heat.—like the sloping sides of a hot-house.

TILED ROOFS FOR MODERN BUILDINGS

A number of years ago an effort was made by a French publication to arrive at a rule for the pitch of roofs based upon climatic conditions. The globe between the equator and the polar circle was divided into twenty-four belts or bands parallel to the equator, but of unequal size, depending upon the length of the longest day. Allowances were made for dryer and damper climates, and for the shape of the tiles; "in the roofs of the continent covered with the hollow tile (like Mission tile), as in the south of France, for instance, less slope is required than with the Roman tiles which are in sections alternately flat and circular, and these again require less slope than the common plain tile or slate." A table constructed in accordance with the theory gives the following variations in pitch for the countries, localities and materials named

LOCALITY	HOLLOW TILES	PLAIN TILES
Southern Spain—pitch	16 deg. 12 min.	24 deg. 12 min.
" Italy	18 " 12 "	26 " 12 "
" France	21 "	29 "
Northern "	24 " 36 "	32 " 36 "
" Germany	28 " 36 "	36 " 36 "
England (London)	27 " 24 "	35 " 24 "
Scotland	33 " 12 "	42 " 12 "
Sweden, Russia and Norway (average)	30 "	49 "
According to above table Southern California would require about	17 "	26 "

In pitch, the Mission roofs varied greatly. The variations are as numerous as the structures themselves. No rule of construction can be laid down which would not be compelled to admit brilliant and successful exceptions. The good builder is not restricted by arbitrary considerations, he meets conditions as he finds them and builds as he pleases; if he consider only the needs of the people and the exigencies of environment, and if he uses only the materials of the vicinity, he cannot go far astray.